EEDAL 2011

Lighting Control User Interface Standards

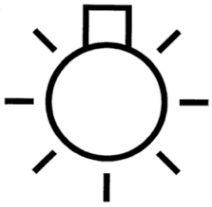
Bruce Nordman
Lawrence Berkeley National Laboratory

May 25, 2011

BNordman@LBL.gov — eetd.LBL.gov/ea/nordman

Overview

- The "User Interface Standard" proposition
- What we found for lighting
- Next steps



Core Team

Bruce Nordman, Jessica Granderson (LBNL)

Kelly Cunningham, Katharine Wu (Calif. Lighting Technology Center)

Also

Kostas Papamichael (CLTC), Alan Meier (LBNL)

The "User Interface Standard" proposition

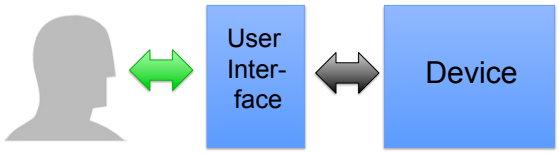
- Lighting energy use is determined in part by **instructions from user**
- Ability of user to convey instructions to lighting controls relies on **communication**
- Communication requires a **common language**

Therefore

- Lighting energy use can be reduced with **common language** for controls

User Interfaces and Energy

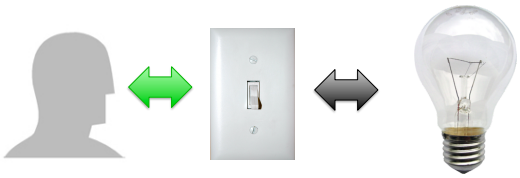
- Lighting, climate control, power control of electronics, cars, batteries, windows, …



- UI is conceptually separate from device

Lighting, Controls, Interfaces

- Past efficiency initiatives on sources, controls, digital interfaces, or combinations of these



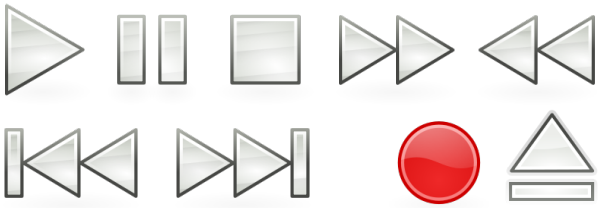
- The Lighting Control User Interface (LC UI) is new addition

Components of UI Standard

- Visual elements
  - Terms
  - Symbols
  - Colors
- Dynamic content
  - Indication
  - Actuation
- Audio elements
  - Sounds
  - Words
- Tactile elements
  - Identification
  - Actuation
- Concepts
  - "collections of meaning"
- Appear in hardware, software, documentation, culture

Standards Symbols

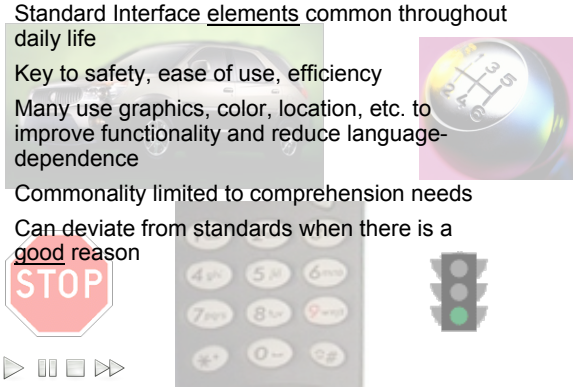
- Tape transport
  - since generalized to any medium



Underlying concept: linear representation of medium

User Interfaces

- Standard Interface elements common throughout daily life
- Key to safety, ease of use, efficiency
- Many use graphics, color, location, etc. to improve functionality and reduce language-dependence
- Commonality limited to comprehension needs
- Can deviate from standards when there is a good reason



UI Standard Concept — Restated

- If User Interface
  - – elements – arrangement

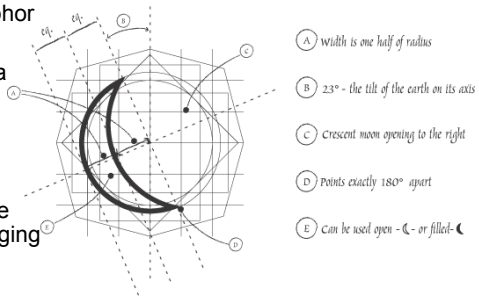
  are
  - – clear – consistent

  then maximize chances of optimal matching of user desires with service delivered
- Consistent **>>** clear
- Should be global

Power control elements

Key Elements of IEEE 1621 – Power Control

- 3 Basic Power States: On, Sleep, Off …
- … with standard colors: Green, Amber, Off
- Key symbols: Power; Sleep
- Sleep Metaphor ("wake up")
- "Hibernate" a form of Off
- Metaphors / Concepts are key to managing complexity

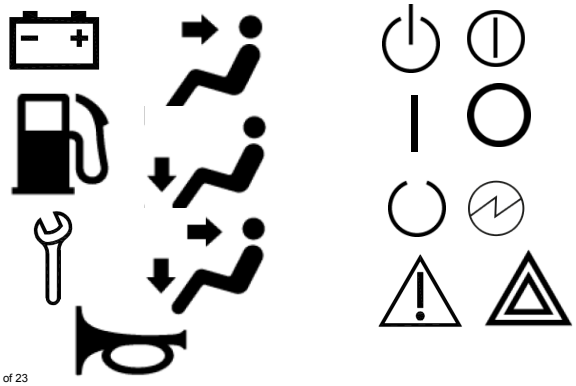


User Interface Standards

- Types of UI Standards
  - Symbols
  - Indicators
  - Actuation
  - UI design principles
- Integrated UI standards
  - IEEE 1621: Power control)
  - SAE J2402: Automobile dashboard elements
    - Surface Vehicle Standard, Road Vehicles —Symbols for Controls, Indicators, and Tell-tales

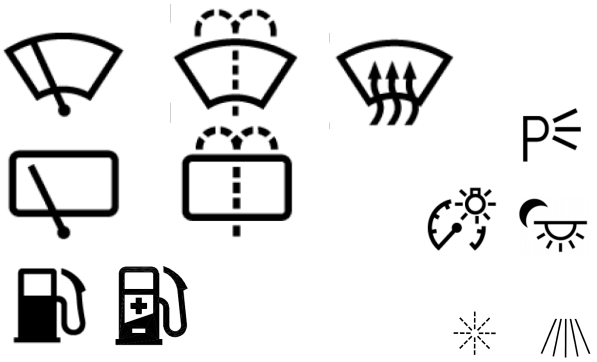
Symbols

- Derived from objects
- Learned



Symbols — Combinations

- More complicated concepts combine two or more symbols

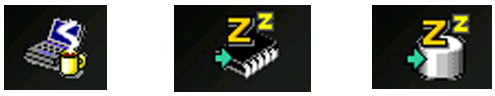


Symbols — Use of letters, words

- Gear shift letters and numbers

P D R N

ABS AUTO



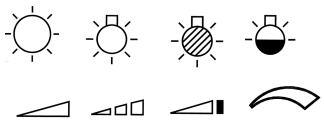
What we found

- No existing standard on lighting control user interfaces specifically
- Many standards that inform UIs generally
  - Indicators, actuators, man-machine interaction principles
- Some relevant symbols
- Common content
  - Elements for multiple end uses (and non-energy)
- Existing controls
  - Over 40% had no visual cues (beyond mechanical construction)
    - Remain opaque even when features added
  - Words use about 3x as often as symbols

Some of my switches

Standard symbols

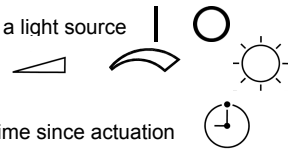
- Organizations: ISO, IEC, SAE
- General lighting and variable control



- Common content
  - General user interface symbols
  - Scheduling, time

Concepts in lighting

- Lighting in General
  - the overall concept of lighting
- Switching
  - basic turning on and off of a light source
- Dimming / Brightness
  - adjusting luminance
- Schedule / Timer
  - control by time of day, or time since actuation
- Dynamic Control
  - controls that automatically change light in response to sensors (occupancy, daylight) or other information
- Color
  - determining specific color of light
- Scenes
  - presets for groups of fixtures


Next steps

- Establish consensus for need for Lighting Control User Interface standard
  - Policy
  - Industry
- Expand survey to global products, standards
- Consider accessibility (disabled, elderly, young, …)
- Develop draft content
- Plan for periodic expansions
- Identify standards organizations
  - US: NEMA ?
  - Global: CIE ? JTC1 ?

Possible initial content

(not part of project)

- Standard symbols
  - Lighting in general
  - Occupancy sensor
  - Daylight sensor
  - Dimming
- Interaction
  - “Up = On - Down = Off”
- Sensor indications
  - Colors
  - Flashing


Summary

- User Interface Standard concept is compelling
  - Existing examples show success, need
- No fundamental barrier to creating one for lighting
- Let’s do it!

Thank you